

## Game Theory

- Example showing importance of strategic thinking:
  - You (firm A) are thinking of buying firm T. The value of T depends on an oil exploration project,  $V$  is uniform on  $[0,100]$
  - A management is better, so value to A is  $1.5*V$
  - A doesn't know outcome of project when it bids
  - T knows outcome before it accepts
  - What price should you (firm A) offer?

# Dominant Strategies

- Best for a player, regardless of other player's response
  - As in our pricing example earlier
- Advertising game

		Firm B	
		advertise	Don't advertise
Firm A	Advertise	(10,5)	(15,0)
	Don't advertise	(6,8)	(10,2)

		Firm B	
		advertise	Don't advertise
Firm A	Advertise	(10,5)	(15,0)
	Don't advertise	(6,8)	(20,2)

- Now what?

# Nash Equilibrium

- A set of strategies such that each player is doing the best it can given the actions of its opponents
  - E.g. Cournot
- Another example, with a Nash Equil:

		Firm 2	
		Crispy	Sweet
Firm 1	Crispy	(-5,-5)	(10,10)
	Sweet	(10,10)	(-5,-5)

- Two Nash equilibria
- Strong incentives to coordinate
- Consider also beach location game

# Maximin

- Another way to find solutions
- Relies less heavily than Nash on individual rationality
- Illustration

		Player 2	
		left	right
Player 1	Top	(1,0)	(1,1)
	bottom	(-1000,0)	(2,1)

- Right is a dominant strategy for 2
- If you were 1, what would you do?
  - Bottom is Nash
  - Top is maximin
- Revisit Prisoner's Dilemma
  - (Confess, confess) is Nash equil.
  - Confess is also maximin
  - Confessing is “very rational”

## Repeated Games

- Should I charge the collusive price or the Nash price?
  - Firms last many periods, so one must worry about future consequences of current decisions
  - If a game repeats forever, then cheating has potentially serious consequences
  - Can provide a way out of the prisoner's dilemma
- But what if a game is repeated a *finite* number of times?
  - Cooperation breaks down in period T

## Sequential Games

- What if one firm gets to go first?
- Return to product choice problem
- Suppose now sweet does better

		Firm 2	
		Crispy	Sweet
Firm 1	Crispy	(-5, -5)	(10, 20)
	Sweet	(20, 10)	(-5, -5)

- Important to go first!

## Threats, Credibility, and Commitment

- Strategic move –
  - one that influences the other person's choice in a manner favorable to one's self, by affecting the other person's expectations of how one's self will behave. One constrains the partner's choice by constraining one's own behavior
- How can you make your threats credible?
- Sometimes you can help yourself by limiting your options
  - Strategic disadvantage

## Entry Deterrence Game

- To deter entry, incumbent must convince potential competitor that entry will be unprofitable
- Firm X (entrant) must invest \$40m to enter

		Potential entrant	
		Enter	Stay out
Incumbent	High price (accommodate)	(50, 10)	(100, 20)
	Low price (war)	(30, -10)	(40, 0)

- Is entry deterred?
- Punishment threat not credible

- Suppose incumbent invests \$30m in extra capacity
- Then payoffs in high price state are lower

		Potential entrant	
		Enter	Stay out
Incumbent	High price (accommodate)	(20, 10)	(70, 20)
	Low price (war)	(30,-10)	(40, 0)

- Now, it's credible that incumbent would adopt low price in response to entry
- More generally, incumbent benefits from being able to convince entrant that it would charge low price
- Appearance of irrationality may help